



GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT & ENTREPRENEURSHIP
DIRECTORATE GENERAL OF TRAINING

COMPETENCY BASED CURRICULUM

SURVEYOR

(Duration: Two Years)

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL- 4



SECTOR – CONSTRUCTION



Directorate General of Training

SURVEYOR

(Engineering Trade)

(Revised in March 2023)

Version: 2.0

CRAFTSMEN TRAINING SCHEME (CTS)

NSQF LEVEL - 4

Developed By

Ministry of Skill Development and Entrepreneurship

Directorate General of Training

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CONTENTS

S No.	Topics	Page No.
1.	Course Information	1
2.	Training System	2
3.	Job Role	6
4.	General Information	7
5.	Learning Outcome	9
6.	Assessment Criteria	11
7.	Trade Syllabus	16
8.	Annexure I (List of Trade Tools & Equipment)	29
9.	Annexure II (List of Trade experts)	

1. COURSE INFORMATION

During the two-year duration a candidate is trained on subjects viz. Professional Skill, Professional Knowledge, Employability skills related to job role. In addition to this a candidate is entrusted to make/do project work and Extra Curricular Activities to build up confidence. The practical skills are imparted in simple to complex manner & simultaneously Professional Knowledge (theory subject) is taught in the same fashion to apply cognitive knowledge while executing task. The practical part starts with simple geometrical drawing and finally ends with preparing topographical map, Cadastral/ mouza map, detailed road project, survey drawing using CAD, application of GIS techniques, Hydrographic survey, Transmission line site survey, railway line site survey, sanction plan of Residential / Public building, and detailed estimate. The broad components covered under Professional Skill subject are as below:-

FIRST YEAR: In the beginning of the course the trainees are acquainted with occupational safety & health, PPE, etc. Observation of all safety aspects is mandatory. The safety aspect covers components like OSH & E, PPE, Fire extinguisher, First Aid, etc. The practical part starts with basic drawing (consisting of lettering, numbering, geometrical figure, symbols & representations). Later the drawing skills imparted are drawing of different scales, projections, perform site survey and prepare a site plan using chain / tape, prismatic compass, perform AutoCAD drawing. Knowledge and application of Computer Aided Drawing has been introduced. Workspace creating drawing using toolbars, commands, and menus. Plotting drawing from CAD. Different site survey using Plane table(radiation, intersection, traversing, determination of height), Theodolite (measurement of angle, traversing, computation of area), Levelling instrument (different levelling – differential, reciprocal, etc.), tacheometer (determination of horizontal and vertical distance, constants, etc.), field book entry, plotting, mapping, calculation of area, preparing traverse drawing, simple building drawing using CAD are being taught in the practical.

SECOND YEAR: Making topographical map using Level instruments with contours (Interpolation of contour, preparation of section, computation of volume, setting of simple, compound, reverse, transition and vertical curve), performing survey using Total Station and preparation of map (measurement of angle, co-ordinates and heights, downloading survey data and plotting), making of site plan by Cadastral survey (preparation of site plan, calculation of plot area, etc.), performing road project survey (location survey and preparation of route map, profile/ longitudinal / cross sectional levelling and plotting) and survey drawing using CAD. Drawing of cartographic projection, setting and application of GIS & GPS techniques in various fields, collection and processing of data, performing hydrographic survey (determining hydrographic depth, measuring velocity of flow, determining cross sectional area of river, calculating the discharge of a river, etc.), performing transmission line site survey (making of alignment, conducting detailed survey, final location survey and making of tower foundation pit point), performing railway line site survey, drawing of building by CAD and preparation of estimation are being done as part of practical training.

2. TRAINING SYSTEM

2.1 GENERAL

Directorate General of Training (DGT) under Ministry of Skill Development & Entrepreneurship offers range of vocational training courses catering to the need of different sectors of the Labour market. The vocational training programmes are running under aegis of Directorate General of Training (DGT). Craftsman Training Scheme (CTS) with variants and Apprenticeship Training Scheme (ATS) are two pioneer schemes of DGT for strengthening vocational training.

Surveyor trade under CTS is one of the most popular courses delivered nationwide through network of ITIs. The course is of two years duration. It mainly consists of Domain area and Core area. The Domain area (Trade Theory & Practical) imparts professional skills and knowledge, while Core area (Employability Skills) imparts requisite core skill, knowledge and life skills. After passing out of the training program, the trainee is awarded National Trade Certificate (NTC) by DGT which is recognized worldwide.

Trainee broadly needs to demonstrate that they are able to:

- Read & interpret technical parameters/documentation, plan work, identify necessary materials and tools;
- Perform task with due consideration to safety rules, accident prevention regulations and environmental protection stipulations;
- Apply professional knowledge, core skills & employability skills while performing the job.
- Check the survey drawing and data and rectify errors.
- Document the technical parameters related to the task undertaken. Process data recorded during field measurements and make relevant conclusions.

2.2 PROGRESSION PATHWAYS:

- Can join industry as Technician and will progress further as Senior Technician, Supervisor and can rise to the level of Manager.
- Can become Entrepreneur in the related field.
- Can take admission in diploma course in notified branches of Engineering by lateral entry.
- Can join Apprenticeship programme in different types of industries leading to National Apprenticeship certificate (NAC).
- Can join Crafts Instructor Training Scheme (CITS) in the trade for becoming instructor in ITIs.
- Can join Advanced Diploma (Vocational) courses under DGT as applicable.

2.3 COURSE STRUCTURE:

Table below depicts the distribution of training hours across various course elements during a period of two years: -

S No.	Course Element	Notional Training Hours	
		1 st Year	2 nd Year
1	Professional Skill (Trade Practical)	840	840
2	Professional Knowledge (Trade Theory)	240	300
3	Employability Skills	120	60
	Total	1200	1200

Every year 150 hours of mandatory OJT (On the Job Training) at nearby industry, wherever not available then group project is mandatory.

On the Job Training (OJT)/ Group Project	150	150
Optional Courses (10th/ 12th class certificate along with ITI certification or add on short term courses)	240	240

Trainees of one-year or two-year trade can also opt for optional courses of up to 240 hours in each year for 10th/ 12th class certificate along with ITI certification or add on short term courses.

2.4 ASSESSMENT & CERTIFICATION

The trainee will be tested for his skill, knowledge and attitude during the period of course through formative assessment and at the end of the training programme through summative assessment as notified by the DGT from time to time.

a) The Continuous Assessment (Internal) during the period of training will be done by **Formative Assessment Method** by testing for assessment criteria listed against learning outcomes. The training institute has to maintain an individual trainee portfolio as detailed in assessment guideline. The marks of internal assessment will be as per the formative assessment template provided on www.bharatskills.gov.in.

b) The final assessment will be in the form of summative assessment. The All India Trade Test for awarding NTC will be conducted Controller of examinations, DGT as per the guidelines. The pattern and marking structure are being notified by DGT from time to time. **The learning outcome and assessment criteria will be the basis for setting question papers for final assessment. The**

examiner during final examination will also check the individual trainee's profile as detailed in assessment guideline before giving marks for practical examination.

2.4.1 PASS REGULATION

For the purposes of determining the overall result, weightage of 100% is applied for six months and one-year duration courses and 50% weightage is applied to each examination for two years courses. The minimum pass percent for Trade Practical and Formative assessment is 60% & for all other subjects is 33%.

2.4.2 ASSESSMENT GUIDELINE

Appropriate arrangements should be made to ensure that there will be no artificial barriers to assessment. The nature of special needs should be taken into account while undertaking the assessment. Due consideration should be given while assessing for teamwork, avoidance/reduction of scrap/wastage and disposal of scrap/waste as per procedure, behavioral attitude, sensitivity to the environment and regularity in training. The sensitivity towards OSHE and self-learning attitude are to be considered while assessing competency.

Assessment will be evidence based comprising some of the following:

- Job carried out in labs/workshop
- Record book/ daily diary
- Answer sheet of assessment
- Viva-voce
- Progress chart
- Attendance and punctuality
- Assignment
- Project work
- Computer based multiple choice question examination
- Practical Examination

Evidences and records of internal (Formative) assessments are to be preserved until forthcoming examination for audit and verification by examining body. The following marking pattern to be adopted for formative assessment:

Performance Level	Evidence
(a) Marks in the range of 60%-75% to be allotted during assessment	
<p>For performance in this grade, the candidate should produce work which demonstrates attainment of an acceptable standard of craftsmanship with occasional guidance, and due regard for safety procedures and practices</p>	<ul style="list-style-type: none"> ● Demonstration of good skill in the use of hand tools, machine tools and workshop equipment. ● 60-70% accuracy achieved while undertaking different work with those demanded by the component/job. ● A fairly good level of neatness and consistency in the finish. ● Occasional support in completing the project/job.
(b) Marks in the range of 75%-90% to be allotted during assessment	
<p>For this grade, a candidate should produce work which demonstrates attainment of a reasonable standard of craftsmanship, with little guidance, and regard for safety procedures and practices</p>	<ul style="list-style-type: none"> ● Good skill levels in the use of hand tools, machine tools and workshop equipment. ● 70-80% accuracy achieved while undertaking different work with those demanded by the component/job. ● A good level of neatness and consistency in the finish. ● Little support in completing the project/job.
(c) Marks in the range of more than 90% to be allotted during assessment	
<p>For performance in this grade, the candidate, with minimal or no support in organization and execution and with due regard for safety procedures and practices, has produced work which demonstrates attainment of a high standard of craftsmanship.</p>	<ul style="list-style-type: none"> ● High skill levels in the use of hand tools, machine tools and workshop equipment. ● Above 80% accuracy achieved while undertaking different work with those demanded by the component/job. ● A high level of neatness and consistency in the finish. ● Minimal or no support in completing the project.

3. JOB ROLE

Topographical Surveyor; surveys land to determine out line, contours and relative position of control points (landmarks) on tract of land, coast, harbor, etc. for preparing topographical and other maps and records. Establishes control points and pillars to do instrumentation work on ground to prepare maps. Provides identification marks on ground for photographs taken in aerial survey. Fixes position of control points on ground in relation to some permanent position and with reference to celestial bodies using theodolites and precise levels, tachometer, digital planimeter etc. Adjusts and sets theodolites, compasses, plane tables, leveling instruments, Total station, GPS, DGPS and other modern instruments for survey, observes and records measurements and angles from three determined points (triangulation), locations to scale on proper sketch. Corrects margin of error due to worn-out tapes which become incorrect, and readings on instruments which are affected by environmental factors.

Plan and organize assigned work and detect & resolve issues during execution in his own work area within defined limit. Demonstrate possible solutions and agree tasks within the team. Communicate with required clarity and understand technical English. Sensitive to environment, self-learning and productivity.

Reference NCO-2015: 2165.0200 - Topographical Surveyor

Reference NOS: -

- | | |
|--------------|--------------|
| a) CON/N9002 | h) CON/N1302 |
| b) CSC/N9401 | i) CSC/N9402 |
| c) CON/N9409 | j) CON/N9410 |
| d) CON/N0904 | k) CON/N9411 |
| e) CON/N0907 | l) CON/N9412 |
| f) CON/N0906 | m) CON/N9413 |
| g) CON/N0905 | n) CON/N9414 |

4. GENERAL INFORMATION

Name of the Trade	SURVEYOR
Trade Code	DGT/1018
NCO - 2015	2165.0200
NOS Covered	CON/N9002, CSC/N9401, CON/N9409, CON/N0904, CON/N0907, CON/N0906, CON/N0905, CON/N1302, CSC/N9402, CON/N9410, CON/N9411, CON/N9412, CON/N9413, CON/N9414
NSQF Level	Level – 4
Duration of Craftsmen Training	Two Years (2400 hours + 300 hours OJT/Group Project)
Entry Qualification	Passed 10 th class examination
Minimum Age	14 years as on first day of academic session.
Eligibility for PwD	LD, CP, LC, DW, AA, LV, DEAF, AUTISM, SLD, MD
Unit Strength (No. Of Student)	24 (There is no separate provision of supernumerary seats)
Space Norms	64 Sq. M
Power Norms	3 KW
Instructors Qualification for	
(i) Surveyor Trade	<p>B.Voc/Degree in Survey Engineering / Civil Engineering from AICTE/UGC recognized Engineering College/ university with one-year experience in the relevant field.</p> <p style="text-align: center;">OR</p> <p>03 years Diploma in Survey Engineering /Civil Engineering from AICTE /recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with two years' experience in the relevant field.</p> <p style="text-align: center;">OR</p> <p>NTC/NAC passed in the Trade of "Surveyor" With three years' experience in the relevant field.</p> <p>Essential Qualification: Relevant Regular / RPL variants of National Craft Instructor Certificate (NCIC) under DGT.</p> <p>NOTE :Out of two Instructors required for the unit of 2 (1+1), one must have Degree/ Diploma and other must have NTC/NAC</p>

	qualifications. However, both of them must possess NCIC in any of its variants.
(ii) Workshop Calculation & Science	<p>B.Voc/Degree in Engineering from AICTE/UGC recognized Engineering College/ university with one-year experience in the relevant field.</p> <p style="text-align: center;">OR</p> <p>03 years Diploma in Engineering from AICTE / recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with two years' experience in the relevant field.</p> <p style="text-align: center;">OR</p> <p>NTC/ NAC in any one of the engineering trades with three years' experience.</p> <p>Essential Qualification: National Craft Instructor Certificate (NCIC) in relevant trade.</p> <p style="text-align: center;">OR</p> <p>NCIC in RoDA or any of its variants under DGT.</p>
(iii) Employability Skill	<p>MBA/ BBA / Any Graduate/ Diploma in any discipline with Two years' experience with short term ToT Course in Employability Skills.</p> <p>(Must have studied English/ Communication Skills and Basic Computer at 12th / Diploma level and above)</p> <p style="text-align: center;">OR</p> <p>Existing Social Studies Instructors in ITIs with short term ToT Course in Employability Skills.</p>
(iv) Minimum Age for Instructor	21 Years
List of Tools and Equipment	As per Annexure – I

Learning outcomes are a reflection of total competencies of a trainee and assessment will be carried out as per the assessment criteria.

5.1 LEARNING OUTCOMES

FIRST YEAR:

1. Concept of drawing & sheet layout following safety precautions. (NOS: CON/N9002)
2. Draw lettering & numbering applying drawing instruments. (NOS: CSC/N9401)
3. Draw plain geometrical figures, curves & conics. (NOS: CSC/N9401)
4. Construct plain scale, diagonal scale, comparative scale, vernier scale. (NOS: CSC/N9401)
5. Draw conventional signs & symbols used in surveying. (NOS: CSC/N9401)
6. Perform site survey using chain/ tape & prepare a site plan. (NOS: CON/N0904)
7. Perform the site survey using prismatic compass. (NOS: CON/N9409)
8. Perform Auto Cad drawing. (NOS: CON/N0907)
9. Perform the site survey using plane table. (NOS: CON/N9409)
10. Perform theodolite survey. (NOS: CON/N0906)
11. Perform traverse survey by theodolite & prepare a site map. (NOS: CON/N0906)
12. Determine of R.L & heights of different points by levelling instruments. (NOS: CON/N0905)
13. Perform a road project survey. (NOS: CON/N9409)
14. Perform AutoCAD drawing (single story building). (NOS: CON/N1302)
15. Demonstrate basic mathematical concept and principles to perform practical operations.
Understand and explain basic science in the field of study. (NOS: CSC/N9402)

SECOND YEAR:

16. Performing tachometric survey using tachometer. (NOS: CON/N9410)
17. Make topography map using level instrument with contours. (NOS: CON/N0907)
18. Concept & set out of curves. (NOS: CON/N9411)
19. Perform survey work using modern survey instruments (Total station) for prepare a map. (NOS: CON/N0906)
20. Concept of cadastral survey & make a site plan. (NOS: CON/N9410)
21. Perform survey work to prepare a topographical map, cadastral map (mouza map), road Project (Survey camp in a suitable hilly/undulated area). (NOS: CON/N9412)
22. Perform AutoCAD drawing from field survey data. (NOS: CSC/N9401)
23. Concept & draw cartographic projection. (NOS: CON/N9411)
24. Plan and prepare setting of GIS & GPS, techniques in various fields. (NOS: CON/N9413)
25. Perform Hydrographic survey (cross section & velocity determination) using hydrographic survey instruments. (NOS: CON/N9414)
26. Perform transmission line site survey & prepare a site plan. (NOS: CON/N9409)

27. Perform railway line site survey line survey using modern survey instruments. (NOS: CON/N9409)
28. Draw a double storied building by AutoCAD & prepare a detail estimate of the building. (NOS: CON/N1302)
29. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study. (NOS: CSC/N9402)

6. ASSESSMENT CRITERIA

LEARNING OUTCOMES	ASSESSMENT CRITERIA
FIRST YEAR	
1. Concept of drawing & sheet layout following safety precautions. (NOS: CON/N9002)	Ensure data & information received are sufficient for preparation of drawing.
	Prepare layout of drawing sheet.
	Prepare a title box.
	Set & fix drawing paper on the drawing board.
2. Draw lettering & numbering applying drawing instruments. (NOS: CSC/N9401)	Draw, horizontal line, vertical line, parallel line using T-square, set- square.
	Draw different types of lettering.
	Draw numbers in different fonts.
	Draw different types of lines.
	Dimensioning a drawing. (various types)
3. Draw plain geometrical figures, curves & conics. . (NOS: CSC/N9401)	Draw geometrical figures from given data (different types).
	Construct ellipse and parabolic curves using the various conditions given.
4. Construct plain scale, diagonal scale, comparative scale, vernier scale. (NOS: CSC/N9401)	Draw different types of scales.
	Find out R.F of the scale, calculate the length of the scale on drawing.
	Check the drawing to confirm their correctness.
5. Draw conventional signs & symbols used in surveying. (NOS: CSC/N9401)	Draw some conventional signs & symbols used in topographic maps.
6. Perform site survey using chain/ tape & prepare a site plan. (NOS: CON/N0904)	Perform surveying measuring distance by chain/ tape and other accessories.
	Errors in chaining and their corrections.
	Enter measured data in field book and plotting the same.
	Conduct chain surveying and prepare a site plan.
	Calculate area of a plot.
7. Perform the site survey using	Measure bearings of a line and conduct the traverse survey

prismatic compass. (NOS: CON/N9409)	using prismatic other accessories.
	Entry in field book and Compute the correct bearings.
	Plotting the traverse & adjust the closing error.
	Calculate the area of the traverse.
8. Perform Auto Cad drawing. (NOS: CON/N0907)	Draw some figures using Auto Cad.
9. Perform the site survey using the plane table. (NOS: CON/N9409)	Set up the plane table including – centring, levelling & orientation.
	Perform plane table survey on field by radiation method.
	Perform plane table survey by intersection, resection method.
	Perform a plane table survey by traversing method with all details.
10. Perform Theodolite survey. (NOS: CON/N0906)	Temporary adjustment of Theodolite. (set up, centring, levelling, focussing).
	Measure horizontal angle by various method & enter into field book.
	Measure vertical angle.
	Determine height of a tower/ post using Theodolite.
11. Perform traverse survey by Theodolite & prepare a site map. (NOS: CON/N0906)	Conduct reconnaissance survey prepare key plan.
	Mark the station point.
	Prepare reference sketch.
	Measure lengths & bearing.
	Measure horizontal angles (repetition method).
	Compute co-ordinates, check angles, calculate bearings, find consecutive co-ordinates & independent co-ordinates.
	Plot the traverse.
	Calculate the area by co-ordinates methods.
12. Determine RL and heights by levelling instruments of different points. (NOS: CON/N0905)	Set levelling instruments and temporary adjustment. (Dumpy/ Auto level).
	Determine reduced level and check it.
	Conduct reciprocal levelling.
	Fix up a benchmark.

13. Perform a road project survey. (NOS: CON/N9409)	Prepare a longitudinal levelling and plot it.
	Prepare a cross section levelling and plot it.
	Determine formation level, depth of cutting and depth of filling on longitudinal section.
	Calculate the earth work volume.
14. Perform AutoCAD drawing (single story building). (NOS: CON/N1302)	Draw a survey traverse using AutoCAD command.
	Draw a simple building using AutoCAD command.
15. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study. (NOS: CSC/N9402)	Solve different mathematical problems
	Explain concept of basic science related to the field of study
SECOND YEAR	
16. Perform tachometric survey using tachometer. (NOS: CON/N9410)	Determine the stadia constant of a tachometer.
	Determine horizontal distance by stadia tachometer.
	Determine vertical distance by stadia tachometer.
17. Make topography map using level instrument with contours. (NOS: CON/N0907)	Fix horizontal & vertical control points.
	Prepare a contour map (by square method).
	Make cross section on contour map.
	Mark the gradient on contour map.
	Calculate the volume from contour map by prismatic or trapezoidal formula.
18. Concept & set out of curves. (NOS: CON/N9411)	Draw and mark the parts of simple circular curve.
	Set out a simple circular curve by linear method from given data.
	Set out a simple circular curve by instrument method from given data.
	Set out a simple compound curve by instrument method from given data.
	Set out a simple reverse curve by instrument method from given data.

	Set out a simple transition curve from given data.
19. Perform survey work using modern survey instruments (Total Station) for prepare a map. (NOS: CON/N0906)	Set up the total station. Measure horizontal angle, vertical angle, height by Total Station. Stake out a point by using Total Station. Download & plot the survey map.
20. Concept of cadastral survey & make a site plan. (NOS: CON/N9410)	Prepare a cadastral map. (including inking & plot numbering). Calculate the plot area using digital planimeter. Prepare a site plan from existing cadastral map.
21. Perform survey work to prepare a topographical map, cadastral map (mouza map), road Project (survey camp in a suitable hilly/undulated area). (NOS: CON/N9412)	Prepare a topographical map. (direct & indirect method). Prepare a cadastral map (mouza map). Prepare a detail road project.
22. Perform AutoCAD drawing from field survey data. (NOS: CSC/N9401)	Prepare a traverse drawing by AutoCAD. Prepare a longitudinal & cross section drawing for a road project by AutoCAD.
23. Concept & draw cartographic projection. (NOS: CON/N9411)	Draw various type of cartographic projection. Construct UTM grid for map preparation. Use WGS -84.
24. Plan and prepare setting of GIS & GPS, techniques in various fields. (NOS: CON/N9413)	Setup GPS/DGPS. Collect field data using GPS/DGPS. Process GPS/DGPS data in software. Plot the map by survey software.
25. Perform Hydro graphic Survey using hydro graphic survey instruments. (NOS: CON/N9414)	Determine hydro graphic depth by (sounding method)/ eco sounder. Measure the velocity of flow. Determine the cross-sectional area of a river. Calculate the discharge of a river.

26. Perform transmission line site survey & prepare a site plan. (NOS: CON/N9409)	Conduct reconnaissance survey for select good alignment.
	Conduct detail survey & prepare a profile drawing.
	Conduct final location survey & mark pit points.
27. Perform railway line site survey line survey using modern survey instruments. (NOS: CON/N9409)	Mark a tentative alignment.
	Conduct reconnaissance survey for select good alignment.
	Conduct detail survey & prepare a profile drawing.
	Conduct final location survey & mark alignment.
28. Draw a double storied building by AutoCAD & prepare a detail estimate of the building. (NOS: CON/N1302)	Draw a two storied residential building drawing using AutoCAD command.
	Prepare a detail estimate of the same building.
29. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study. (NOS: CSC/N9402)	Solve different mathematical problems
	Explain concept of basic science related to the field of study

7. TRADE SYLLABUS

SYLLABUS FOR SURVEYOR TRADE			
FIRST YEAR			
Duration	Reference Learning Outcome	Professional Skills (Trade Practical)	Professional Knowledge (Trade Theory)
Professional Skill 56 Hrs.; Professional Knowledge 12 Hrs.	Concept of drawing & sheet layout following safety precautions.	<ol style="list-style-type: none"> 1. Demonstrate of tools & equipment used in the trade. 2. Occupational safety & Health. 3. Introduction of safety equipments and their uses. 4. Introduction of first aid, health, safety & environmental guidelines, legislations & regulations as applicable. 5. Personal Protective Equipment (PPE). 6. Hazard identification and avoidance, Safety signs for Danger. 7. Use of drawing instruments and equipments with care. 8. Method of fixing of drawing sheet on drawing board. 9. Layout of different size of drawing sheet and folding of sheets. 	<p>Importance of safety and general precautions related to the trade.</p> <p>All necessary guidance to be provided to the newcomers to become familiar with the working of ITI system.</p> <p>Importance of survey or trade Job after completion of training.</p> <p>Introduction of First aid.</p> <p>Job responsibility of the trade.</p> <ul style="list-style-type: none"> ● Overview the subject to be taught. ● List of the instrument equipments to be used during training ● Layout of drawing sheet ● Dimensions of drawing sheet.
Professional Skill 56 Hrs.; Professional Knowledge	Draw lettering & numbering applying drawing instruments.	<ol style="list-style-type: none"> 10. Lettering & numbering (Single & double stroke) 11. Types of lines and dimensioning. 	Details layout of lettering, lines & dimensioning system.

18 Hrs.			
Professional Skill 28Hrs.; Professional Knowledge 06Hrs.	Draw plain geometrical figures, curves & conics	12. Construction of plain geometrical figures, curves & conics.	Introduction of surveying, types of surveying, use, application principal.
Professional Skill 28Hrs.; Professional Knowledge 08Hrs.	Construct plain scale, diagonal scale, comparative scale, vernier scale.	13. Drawing of: - Construction of scales – plain, diagonal, vernier.	Knowledge of different types of scales, determine of R.F & uses of scales.
Professional Skill 28Hrs.; Professional Knowledge 06 Hrs.	Draw conventional signs & symbols used in surveying.	14. Drawing of conventional signs & symbols. 15. Free hand sketch of liner measurement instruments.	Use & application of conventional signs & symbols.
Professional Skill 84 Hrs.; Professional Knowledge 18Hrs.	Perform site survey using chain/ tape & prepare a site plan.	16. Practice of folding & unfolding of chain. 17. Equipment and instrument used to perform surveying & testing of chain. 18. Ranging (direct/ indirect) & distance measure with chain/ tape. 19. Offset taking & entering field book. 20. Overcoming obstacles in chaining. 21. Chaining on sloping ground. 22. Conduct a chain survey of a small area with all details and plotting the map. 23. Calculating the area of site. 24. Prepare a site plan by the	Uses of Chain/ tape, testing of a chain & correction. Ranging (direct & indirect), Principle of chain survey, application. Terms used in chain survey, Offset, types of offsets, limit of offset, field book, types of field book, entry of field book method of chaining in slopping ground. Field procedure of chain survey errors in chain survey, plotting procedure. Calculation of area (regular & irregular figure) Knowledge of site plan.

		help of chain / tape.	
Professional Skill 112 Hrs.;	Perform the site survey using prismatic compass.	25. Temporary adjustment of prismatic compass. 26. Measure fore & back bearing of a line. 27. Measure true bearing of a line. 28. Prepare a closed & open traverse using prismatic compass measure the bearings, entry into field book, calculation of correct bearing and adjust. (Local attraction), determine the closing error and adjust. Plotting the same.	Basic terms used in compass survey. Instrument & it setting up. Conversion of bearing web to R.B. Calculation of included angle from bearing local attraction, magnetic declination and true bearing, closing error. Adjustment of closing error, precaution in using prismatic compass.
Professional Knowledge 24 Hrs.			
Professional Skill 28 Hrs.;	Perform Auto CAD drawing.	29. Practice with AutoCAD using commands	Introduction to Auto CAD. Use AutoCAD command.
Professional Knowledge 06Hrs.			
Professional Skill 84 Hrs.;	Perform the site survey using the plane table.	30. Demonstration of instrument used for plane table surveying & their uses (alidade, U-fork, trough compass) Set up the plane table <ul style="list-style-type: none"> ● Centring ● Levelling ● Orientation 31. Practice the method of plane tabling <ul style="list-style-type: none"> ● Radiation ● Intersection ● Resection ● Traversing 	Plane table survey, principle, merits & demerits Instrument used in plane table survey setting up the plane table. (centering, levelling, orientation) Methods of plane table survey (radiation, intersection, resection, traversing) Error in plane table survey.
Professional Knowledge 18Hrs.			

		32. Determination of height by telescopic alidade.	
Professional Skill 56 Hrs.; Professional Knowledge 18Hrs.	Perform Theodolite survey.	33. Practice to set up the Theodolite 34. Reading the vernier & booking (hor./ver.) Angle. 35. Perform permanent adjustment of Theodolite 36. Measurement of horizontal angle by various methods. 37. Setting out the angles. 38. Measurement of vertical angle, deflection angle. 39. Prolongation of line by various methods. 40. Determination of height of inaccessible object by Theodolite.	Introduction to Theodolite. Types of Theodolite, parts of Theodolite, Terms used in Theodolite survey. Temporary adjustment of Theodolite, Angle measurement process. Reading of angles, field book entry of measured angles. Permanent adjustment of Theodolite.
Professional Skill 84Hrs.; Professional Knowledge 24Hrs.	Perform traverse survey by Theodolite & prepare a site map.	41. Traversing (closed & open) using Theodolite & tape/chain. 42. Measurement of horizontal angles & bearing of a line. 43. Computation of coordinates from the bearing, angle length. 44. Preparation of gales traverse table. 45. Computation of area using co-ordinates. 46. Determine omitted measurements.	Traversing using theodolite (closed & open), traverse computation, determination of consecutive coordinates, independent co-ordinate, checking & balancing of traverse, preparation of gales traverse table, computation of area using co-ordinates, calculation of omitted measurement.
Professional Skill 84Hrs.; Professional Knowledge	Determine of RL and heights of different points by levelling instruments.	47. Practice in setting up of dumpy level and performing temporary adjustments 48. Practice in staff reading	Introduction to levelling. Types of levelling instrument. Technical terms used in levelling Temporary & permanent

18Hrs.		<p>49. Practice in simple levelling</p> <p>50. Practice differential levelling (fly levelling)</p> <p>51. Practice reciprocal levelling.</p> <p>52. Carryout levelling field book.</p> <p>53. Equate reduction of level (rise fall method, height of instrument method) comparison of method.</p> <p>54. Solve problems on reduction of level.</p> <p>55. Practice levelling with (auto / digital level)</p> <p>56. Practice profile levelling or longitudinal & cross section levelling, plotting the profile.</p> <p>57. Check levelling</p>	<p>adjustment.</p> <p>Different types of levelling</p> <p>Entry of level book. (Reduced level calculation method)</p> <p>Curvature & refraction effect</p> <p>sensitivity of bubble tube.</p> <p>Common error and their elimination.</p> <p>Degree of accuracy.</p>
Professional Skill 56Hrs.;	Perform a road project survey.	<p>58. Road project reconnaissance.</p> <p>59. Preliminary survey.</p> <p>60. Final location survey including preparation of route map.</p> <p>61. Profile or longitudinal & cross-sectional levelling & plotting.</p>	<p>Types of surveys for location of a road. Points to be considered during reconnaissance survey.</p> <p>Classification of roads and terms used in road engineering, alignment of roads relative importance of length of road, height of embankment depth of cutting & filling, road gradients super elevation etc.</p>
Professional Skill 56 Hrs.;	Perform AutoCAD drawing (single story building)	<p>62. Prepare traverse drawing using Auto cad.</p> <p>63. Prepare a simple building</p> <p>64. Drawing using Auto cad.</p>	Use AutoCAD command for drawings.
WORKSHOP CALCULATION & SCIENCE: (40 Hrs)			
Professional	Demonstrate basic	Unit, Fractions	

<p>Knowledge WCS- 40 Hrs.</p>	<p>mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study.</p>	<p>Classification of unit system Fundamental and Derived units F.P.S, C.G.S, M.K.S and SI units Measurement units and conversion Factors, HCF, LCM and problems Fractions - Addition, subtraction, multiplication & division Decimal fractions - Addition, subtraction, multiplication & division Solving problems by using calculator Square root, Ratio and Proportions, Percentage Square and square root Simple problems using calculator Applications of Pythagoras theorem and related problems Ratio and proportion Ratio and proportion - Direct and indirect proportions Percentage Percentage - Changing percentage to decimal and fraction Material Science Physical and mechanical properties of metals Difference between iron & steel, alloy steel and carbon steel Mass, Weight, Volume and Density Mass, volume, density, weight and specific gravity Related problems for mass, volume, density, weight and specific gravity Heat & Temperature and Pressure Concept of heat and temperature, effects of heat, difference between heat and temperature, boiling point & melting point of different metals and non-metals Scales of temperature, Celsius, Fahrenheit, kelvin and conversion between scales of temperature Co-efficient of linear expansion Mensuration Area and perimeter of square, rectangle and parallelogram Area and perimeter of Triangles Area and perimeter of circle, semi-circle, circular ring, sector of circle, hexagon and ellipse Surface area and volume of solids - cube, cuboid, cylinder, sphere and hollow cylinder Finding the lateral surface area, total surface area and capacity in litres of hexagonal, conical and cylindrical shaped vessels</p>
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		Trigonometry Measurement of angles Trigonometrical ratios Trigonometrical tables
Project work/ Industrial Visit: Broad area: <ul style="list-style-type: none">a) Prepare a traverse map with theodolite, & others survey instrumentsb) Prepare a longitudinal section (more than 300 metre).c) Draw a single-story building using AutoCAD.		

SYLLABUS FOR SURVEYOR TRADE			
SECOND YEAR			
Duration	Reference Learning Outcome	Professional Skills (Trade Practical)	Professional Knowledge (Trade Theory)
Professional Skill 56Hrs.; Professional Knowledge 12Hrs.	Performing tachometric survey using tachometer.	65. Determination of horizontal and vertical distances by tachometric method. 66. Determination of stadia constants of a tachometer.	Introduction of tachometry & terms use advantages and disadvantages. Tachometric constants & its determination. Determination of horizontal & vertical distances by various methods.
Professional Skill 112 Hrs.; Professional Knowledge 32 Hrs.	Make topography map using level instrument with contours.	67. Prepare contour (direct/ indirect method) 68. Interpolation of contour. 69. Draw contour lines. 70. Locating contour gradients. 71. Preparation of section from contour map. 72. Computation of volume (prismoidal / trapezoidal) formula. 73. Establishment of gradient by abney level. 74. Make a topography map with contours. (indirect method)	Contouring, contour interval selection of contour interval, characteristics of contour, uses of contour contouring by various method. Interpolation of contour by various methods, drawing of contours, computation of volume establishment of gradient by abney level.
Professional Skill 112 Hrs.; Professional Knowledge 32 Hrs.	Concept & set out of curves.	75. Computation of elements of simple curve. 76. Set out of simple curve by linear method. 77. Set out of simple curve by instrument method. 78. Set out of compound curve by instrument method.	Curves, Purpose, Types of curves – simple, compound, reverse, transition, vertical. Elements of simple curve, computation of elements of simple curve. Various methods for setting out simple, compound, reverse, transition & vertical curve.

		<p>79. Set out of reverse curve by instrument method.</p> <p>80. Set out of transition curve by instrument method.</p> <p>81. Set out of vertical curve by instrument method.</p>	
<p>Professional Skill 112 Hrs.;</p> <p>Professional Knowledge 32 Hrs.</p>	<p>Perform survey work using modern survey instruments (Total station) for prepare a map.</p>	<p>82. Temporary adjustment of Total station.</p> <p>83. Measurement of angle & coordinates and heights.</p> <p>84. Traversing using Total station.</p> <p>85. Download survey data and Plotting.</p>	<p>Familiarization with modern survey instruments. Parts of Total station, temporary adjustment of T.S, working procedure of T.S.</p>
<p>Professional Skill 28Hrs.;</p> <p>Professional Knowledge 08 Hrs.</p>	<p>Concept of cadastral survey & make a site plan.</p>	<p>86. Prepare a site plan by the help of mouza map.</p> <p>87. Calculate the plot area by digital planimeter.</p>	<p>Familiarisation with cadastral map, term used in cadastral survey, preliminary knowledge for prepare a site plan. Calculation of area by digital planimeter.</p>
<p>Professional Skill 56 Hrs.;</p> <p>Professional Knowledge 16 Hrs.</p>	<p>Perform survey work for prepare a topographical map, cadastral map (mouza map), road project (Survey camp in a suitable hilly / undulated area).</p>	<p>88. Prepare topographical map (direct & indirect method).</p> <p>89. Make a cadastral/ mouza map & calculate the plot area.</p> <p>90. Prepare a detail road project more than 1KM.</p>	<p>Details knowledge for preparation of topographical map. Details knowledge for preparation of cadastral map. Details knowledge for preparation of a road project.</p>
<p>Professional Skill 28Hrs.;</p> <p>Professional Knowledge 08Hrs.</p>	<p>Perform AutoCAD drawing from field survey data.</p>	<p>91. Survey drawing practice using AutoCAD commands</p>	<p>Use auto cad command survey software for survey drawing.</p>
<p>Professional Skill 28 Hrs.;</p> <p>Professional</p>	<p>Concept & draw cartographic projection.</p>	<p>92. Drawing of Simple conical projection, polyconic, lambert's & UTM (Universal Transverse</p>	<p>Importance of cartographic projection. Uses of various types of cartographic projection for mapping.</p>

Knowledge 08 Hrs.		Mecrcator). 93. Construction of UTM Grid. 94. Use datum defining system 1984 (WGS-84).	
Professional Skill 112Hrs.; Professional Knowledge 36Hrs.	Plan and prepare setting of GIS & GPS, techniques in various fields.	95. Setting of GPS/DGPS. 96. Data collection (measurement of line & calculation of area) 97. Data collection in DGPS mode. 98. Processing of GPS data in software. 99. Plotting the contour lines with the help of Auto Civil/ Civil 3D Software/any other software.	Introduction of GIS& GPS. Elements of GPS/DGPS. Observation principles. Sources of error & handling of error in GPS. Various type of GPS application. Concept & use of survey software.
Professional Skill 28 Hrs.; Professional Knowledge 20 Hrs.	Perform the hydrographic survey (cross section & velocity determination) using the hydrographic survey instruments.	100. Determine hydro graphic depth by (sounding method)/ eco sounder. 101. Measure the velocity of flow. 102. Determine the cross-sectional area of a river. 103. Calculate the discharge of a river.	Introduction to hydrographic survey, practice various methods of water depth measurement process, flow velocity measurement & determination of cross-sectional area of a river. Handling of eco sounder, current meter.
Professional Skill 28 Hrs.; Professional Knowledge 16Hrs.	Perform transmission line site survey & prepare a site plan.	104. Justify constructing a new transmission line. 105. Marking of tentative alignment on existing topographical map. 106. Conduct reconnaissance /preliminary survey & select a good alignment. 107. Conduct detailed survey, prepare a profile drawing using sag	Basic terms used in transmission line survey, justification criteria for constructing new line, marking process of tentative alignment, selection process of a good alignment. Process of detail survey & final location survey. Use of sag template, Various type of tower, construction of tower foundation.

		<p>template.</p> <p>108. Conduct final location survey.</p> <p>109. Mark tower foundation pit point (as per type of tower)</p>	
<p>Professional Skill 28 Hrs.;</p> <p>Professional Knowledge 08 Hrs.</p>	<p>Perform the railway line site survey using modern survey instruments.</p>	<p>110. Justify to construct a new Railway line.</p> <p>111. Marking of tentative alignment.</p> <p>112. Conduct reconnaissance /preliminary survey & select a good alignment.</p> <p>113. Conduct detailed survey, prepare of drawing including design of curves with setting out table.</p> <p>114. Conduct final location survey.</p>	<p>Basic terms used in railway line project survey, justification criteria for constructing new line, marking process of tentative alignment, selection process of a good alignment. Process of detail survey & final location survey.</p>
<p>Professional Skill 112Hrs.;</p> <p>Professional Knowledge 32Hrs.</p>	<p>Draw a double storied building by AutoCAD& prepare a detailed estimate of building.</p>	<p>115. Draw a double storied residential building plan, elevation, cross section, site plan, lay out plan, foundation details etc.</p> <p>116. Prepare a detail estimate of this building.</p>	<p>Specification & uses of various types of building materials, types of foundation, knowledge of R.C.C. works, & other construction related items. Procedure of prepare a detail estimate.</p>
WORKSHOP CALCULATION & SCIENCE: (40 Hrs)			
<p>Professional Knowledge WCS- 40 Hrs.</p>	<p>Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study.</p>	<p>Area of cut out regular surfaces and area of irregular surfaces Area of cut out regular surfaces - circle, segment and sector of circle Related problems of area of cut out regular surfaces - circle, segment and sector of circle Area of irregular surfaces and application related to shop problems Algebra Algebra - Addition, subtraction, multiplication & division Algebra - Theory of indices, algebraic formula, related problems Profit and Loss</p>	

		<p>Profit and loss - Simple problems on profit & loss</p> <p>Estimation and Costing</p> <p>Estimation and costing - Simple estimation of the requirement of material etc., as applicable to the trade</p> <p>Estimation and costing - Problems on estimation and costing.</p>
<p>Project work</p> <p>a) Prepare a two storied residential building plan & prepare a detail estimate.</p>		

SYLLABUS FOR CORE SKILLS

1. Employability Skills (Common for all CTS trades) (120 Hrs. + 60 Hrs.)

Learning outcomes, assessment criteria, syllabus and Tool List of Core Skills subjects which is common for a group of trades, provided separately in www.bharatskills.gov.in / www.dgt.gov.in

List of Tools and Equipment			
Surveyor (For batch of 24 candidates)			
S No.	Name of the Tools and Equipment	Specification	Quantity
A. TOOLS, EQUIPMENT & GENERAL OUTFIT			
1.	Abney level		1 No.
2.	Box sextant		1 Nos.
3.	Binocular		4 Nos.
4.	Chalk board/White board		1 No.
5.	Scientific calculator		2 Nos.
6.	Computing scales two hectares		4 Nos.
7.	Computing scales five hectares		4 Nos.
8.	Offset scale for cadastral survey		4 Nos
9.	Metal cross staff- box type		2 Nos.
10.	Metal cross staff- open type		2 Nos.
11.	Drawing Board	1250mmx900mm	25 Nos.
12.	Engineer's chain		2 Nos.
13.	Dumpy level		6 Nos.
14.	Auto level		6 Nos.
15.	Fire extinguisher		1 No.
16.	Gunter's chain		4 Nos.
17.	Height indicators		8 Nos.
18.	Instructor's chair		1 No.
19.	Instructor's table		1 No.
20.	Tracing board with lamp		2 Nos.
21.	Leveling staff –	4M	13Nos.
22.	Metric chain-	30 m & 20 m	5 each
23.	Magnifying glass		2 Nos.
24.	Magnet bar (for magnetizing through compass needles)		2 Nos.
25.	Pen knife		5 Nos.
26.	Prismatic compass		5 Nos.

27.	Planimeter	Digital	2 Nos.
28.	Plane table with stand, accessories & water proofing cover		8 Nos.
29.	Telescopic alidade		2 Nos.
30.	Indian pattern clinometers		2 Nos.
31.	Ranging rod	2 m	44 Nos.
32.	Offset rod		5 Nos.
33.	Optical square		5 Nos.
34.	Railway curves-	Set of 50 in a box	4 Nos.
35.	Steel almirah	Big	4 Nos.
36.	Stool		25 Nos.
37.	Survey plotting scale-	8 scales with offset scale in box	4 sets
38.	Stencil set		4 Nos.
39.	Fibre glass tape	30 m	12 Nos.
40.	Steel tape	30 m	12 Nos.
41.	Steel band	30 m	2 Nos
42.	Surveyor's umbrella		4 Nos.
43.	Theodolite transit		5 Nos.
44.	Computer	CPU: 32/64 Bit i3/i5/i7 or latest processor, Speed: 3 GHz or Higher. RAM:-4 GB DDR-III or Higher, Wi-Fi Enabled. Network Card: Integrated Gigabit Ethernet, with USB Mouse, USB Keyboard and Monitor (Min. 17 Inch.) Licensed Operating System and Antivirus compatible with trade related software.	5 sets
45.	software		As required
46.	Total station		2 Nos.
47.	DGPS-latest version		2 Nos.

48.	Hand GPS-latest version		2 Nos.
49.	A3 size Printer-	Colour	1 No.
50.	Computer table		5 Nos.
51.	Computer chair		5 Nos.
52.	Printer table		1 No.
53.	UPS		As required
54.	Echo Sounder		1 No
55.	Current Meter		1 No

Note:

1. *Internet facility is desired to be provided in the classroom.*

The DGT sincerely acknowledges contributions of the Industries, State Directorates, Trade Experts, Domain Experts, trainers of ITIs, NSTIs, faculties from universities and all others who contributed in revising the curriculum.

Special acknowledgement is extended by DGT to the following expert members who had contributed immensely in this curriculum.

List of Expert members contributed/ participated for finalizing the course curriculum of Surveyor trade held at CSTARI, Kolkata on 9th November'2017.			
S No.	Name & Designation Shri/Mr./Ms.	Organization	Remarks
1.	B.V.S. Sessa Chari, Director	CSTARI, Kolkata	Chairman
2.	Bhupinder Singh, Ph.D., Associate Professor	Indian Institute of Technology, Roorkee	Expert
3.	S.K. Bhattachariya, Proprietor	ESBEE Associates, Kolkata	Member
4.	B. Maity, Chief Executive	Pioneer Surveyors Newtown, Kolkata-700156	Member
5.	Ram Ch. Bid, Asst. Engineer	CPWD/KCD-V, Nizam Palace, Kolkata	Member
6.	Utpal Banerjee, Operation Manager	Wazir Advisor Pvt. Ltd., Kolkata	Member
7.	Prodyut Kr. Ghosh, Survey Co- Ordinator	ESBEE Associates, Kolkata	Member
8.	SubrataGuha, Junior Engineer	CPWD/KCD-V, Nizam Palace, Kolkata	Member
9.	Angad Yadav, Principal	Archana Institute of Technical Education and Research, Prantik Township,Bolpur	Member
10.	NarendraNathSaha, Instructor	S.P.B. Technical Institute, Uchalan, Burdwan	Member
11.	Sk. HabibulRahaman, Sr. GIS Engineer	Archana Institute of Technical Education and Research, Prantik Township,Bolpur	Member
12.	Rinku Das, Instructor	ITI Howrah Homes	Member
13.	Harun Ali Seikh, Instructor	S.P.B. Technical Institute, Uchalan, Burdwan	Member
14.	Amrita Gopal Gantait, Instructor	Govt. I.T.I. Tollygunge, West Bengal	Member

15.	L.K. Mukherjee, DDT	CSTARI, Kolkata	Member
16.	NirmalyaNath, ADT	CSTARI, Kolkata	Member
17.	P.K. Ghosh, SR. D/Man	CSTARI, Kolkata	Member
18.	B.K. Nigam, Trg.Officer	CSTARI, Kolkata	Member
19.	A. Pandey, Trg.Officer	CSTARI, Kolkata	Member
20.	R. N. Manna, Trg.Officer	CSTARI, Kolkata	Co Ordinator Member

ABBREVIATIONS

CTS	Craftsmen Training Scheme
ATS	Apprenticeship Training Scheme
CITS	Craft Instructor Training Scheme
DGT	Directorate General of Training
MSDE	Ministry of Skill Development and Entrepreneurship
NTC	National Trade Certificate
NAC	National Apprenticeship Certificate
NCIC	National Craft Instructor Certificate
LD	Locomotor Disability
CP	Cerebral Palsy
MD	Multiple Disabilities
LV	Low Vision
HH	Hard of Hearing
ID	Intellectual Disabilities
LC	Leprosy Cured
SLD	Specific Learning Disabilities
DW	Dwarfism
MI	Mental Illness
AA	Acid Attack
PwD	Person with disabilities

